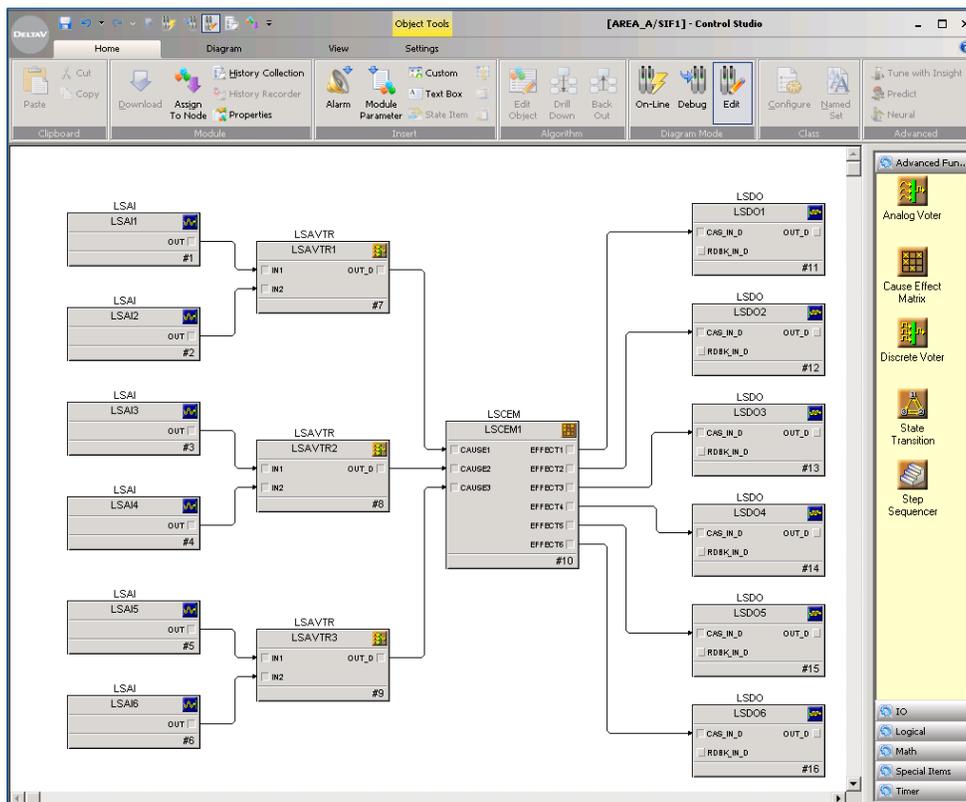


# DeltaV SIS™ Engineering Tools



DeltaV SIS™ engineering tools provide an easy, yet powerful configuration environment.

- Powerful functionality, yet easy to use
- IEC 61508 built-for-purpose certified function blocks
- Integrated, role-based user access

## Introduction

The DeltaV SIS™ process safety system gives you the benefits of advanced engineering technology, such as drag-and-drop configuration, comprehensive security, and explorer-based software for intuitive project implementation. The DeltaV SIS engineering tools allow you to manage all aspects of your safety system configuration, including hardware configuration, safety loop strategies, built-in change management, and history.

A standards-based approach makes configuring safety instrumented functions (SIF) in the DeltaV SIS system unique. Certified to comply with IEC 61508, the function blocks are designed to make the implementation and management of the safety configuration straightforward and efficient.

The DeltaV SIS built-for-purpose function blocks can help to eliminate engineering hours required to implement safety applications such as Emergency Shut-down (ESD), Fire and Gas systems (FGS), and Burner Management Systems (BMS). The TÜV-certified function blocks deliver powerful functionality out of the box, simplifying the implementation of complex safety instrumented system (SIS) applications.

Other capabilities that make the DeltaV SIS software easy to engineer include:

- Built-in alarm state engine per EEMUA 191 standard
- Off-line simulation

## Benefits

### Reduced Engineering and Complexity

**Implement Complex Logic.** The logic for safety instrumented functions (SIF) is configured using Control Studio. All of the SIF logic needed for voting, sequencing and/or alarming can be configured in one or more modules with powerful function blocks. A module can contain more than one SIF.

Module templates can also be created for even faster implementation of similar safety loops. Protected modules can be shared between DeltaV SIS systems for reduced complexity in global engineering and IEC 61508 compliance.

**IEC 61508 Built-for-purpose Certified Function Blocks.** The DeltaV SIS function blocks have been designed to combine industry-leading functionality with remarkable ease-of-use. The function blocks reduce the implementation of voting, cause and effect, and sequencing logic. What formerly took pages of ladder logic and custom programming to engineer, it is now a simple drag-and-drop configuration activity, for easy adherence to the safety standards. The function blocks are built to the IEC 61131-3 function block diagrams standard and certified by TÜV, making safety logic development both intuitive and easy.

**Consistent approach with all safety applications.** No matter what application that DeltaV SIS is used for— whether it's emergency shutdown, fire and gas system or burner management systems – all configuration is performed in Control Studio, using the certified function blocks. This consistency enables engineers to more easily configure and troubleshoot all safety loops.

**Easy and Flexible User Management.** The User Manager tools make user administration easy. Pre-built security groups make it easy to give proper authorization for a specific job, while still making it simple to modify or to create new groups.

### Simplified Safety Lifecycle Management

The real-world requirements of managing a process plant safely have also been addressed. For instance, you need to be sure that the valve will perform on demand. You need to decrease the test frequency of the safety functions from six months to the turnaround scheduled every six years. DeltaV SIS platform provides tools such as scheduled partial stroke testing of valves to meet these requirements. An alarm is generated on partial stroke failure or advanced diagnostic alert detection and the valve is available on demand even while the partial stroke test is in progress.

Voter function blocks provide advanced features like built-in bypasses and deviation alarms to improve plant availability. The voting is configured using radio buttons and check-boxes, with extensible blocks ensuring that the same approach is taken throughout the configuration, regardless of the scale of the application in question.

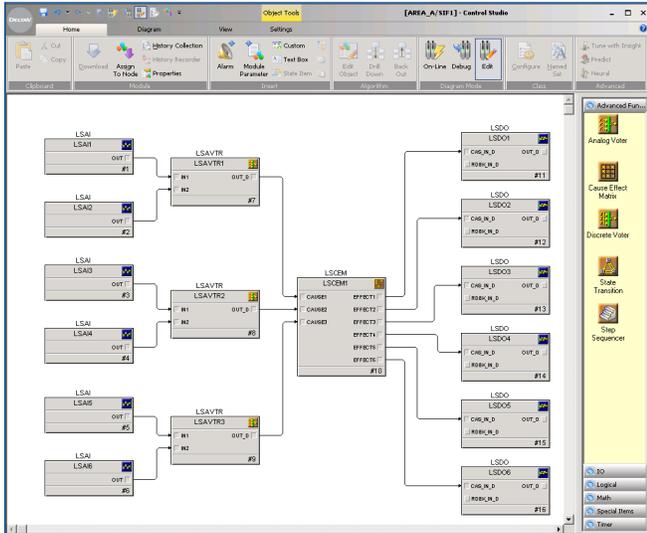
With optionally certified Rosemount transmitters and Fisher Digital Valve Controllers, the DeltaV SIS system and the AMS Device Manager – the architecture is in place. With patented DeltaV SIS function blocks, each one specifically designed to meet an industry need— configuration is a few mouse clicks away. With Control Studio and powerful function blocks – the Safety Integrity Level of the Safety Instrumented Function can be maintained with reduced field tests.

## Product Description

SIF are configured in Control Studio and Explorer. Both software applications are intuitive to use, making it easier for novice users to quickly become productive. Additionally, both have online capabilities for easy troubleshooting. User Manager provides the tools to manage user accounts, privileges and passwords.

### Control Studio

Safety instrumented functions are graphically assembled and modified using common drag-and-drop techniques. Development is visually intuitive, making it easy for first-time users to quickly become productive. Context-sensitive, online help is available for all functions.



Control Studio is a visual tool for configuring safety loops.

## Function Blocks

The function blocks listed and described on subsequent pages are executed within the families of DeltaV SIS logic solvers: Smart Logic Solver (SLS1508) and CHARMS Smart Logic Solver (CSLS).

## Explorer

The Explorer application presents the complete system in a single view and enables direct access to any item. Similar in appearance to Microsoft Windows® Explorer, one can view the overall structure and layout of the system.

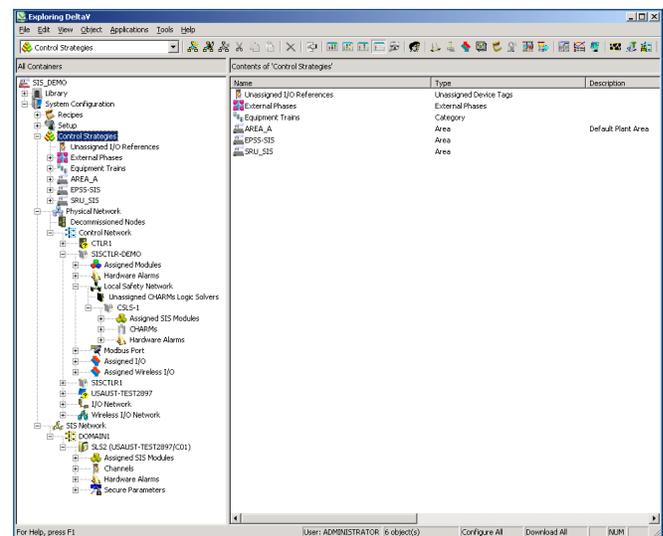
Engineering is simplified with the Explorer auto-sense capability to build your system configuration as you plug in hardware. Logic solvers and HART® devices that are connected to the network will be detected and added to the database with just a couple of clicks.

## Templates

Implementation of DeltaV SIS may require multiple similar modules. One or more module templates can be created that capture logic required for several SIFs, rather than create each module from scratch. Each template is copied and then modified as required. Templates can be used within one DeltaV SIS system or transferred to multiple DeltaV SIS systems.

Each DeltaV SIS system includes one SIS module template. This can be used by simply dragging and dropping the template into a plant area. The template contains no function blocks or logic, but contains two alarms to show the recommended way to handle SIF alarm detection. You can modify the template to suit your needs or create your own templates as required and save them in the template library.

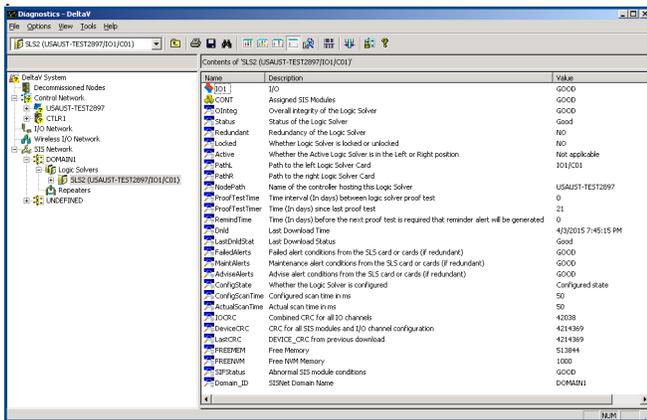
Users can create templates for safety logic on a 'master' DeltaV SIS system and then distribute the templates to engineering centers for implementation. The templates are protected from modification by only allowing changes to occur in the master system.



Explorer provides easy navigation and an intuitive view of the entire DeltaV SIS system.

## Diagnostics Explorer

Just as with the configuration view of the Explorer application, Diagnostics Explorer has the same look and feel as Microsoft Windows Explorer. This application is easily accessed from a context menu in Explorer, from the Operator Interface or from the Windows Start menu.



Diagnostics Explorer provides a common view for system-wide diagnostics.

Diagnostics Explorer provides quick access to detailed integrity information on the logic solvers, I/O channels and safety networks. An event log is included, to track the history of diagnostic events while the application is running.

### User Manager

DeltaV SIS security is completely user modifiable to match each company's security policies. Role-based access provides exactly the right privileges to each user. The User Manager roles support separation of duties for times when management of change procedures require that critical tasks be performed by more than one person. So, for example, a person making a configuration change may not be allowed to implement (download) the change without a second person authorizing the implementation.

Creating secure user access to workstations includes ensuring that users run under Windows with only those privileges required to do a job. This prevents accidental or deliberate damage to critical workstation files or installation of malware.

The User Manager technology helps to enforce plant security policies such as a requirement for individual log-in for system access. The system can switch users without shutting down critical control applications. Two-factor authentication using Smart Cards is also supported.

### DeltaV SIS Function Blocks

Icon	Function Block Description
	<b>Analog Voter (LSAVTR)</b> Compares the inputs against a configured limit to determine the output. If an input is greater than (or less than) the configured limit the block counts that as a vote to set the output to Tripped. If the required number of inputs votes to trip, the output of the block goes to tripped value.
	<b>Discrete Voter (LSDVTR)</b> Reads each input to determine if it is a vote to trip or not. If the required number of inputs is voting to trip, the output goes to the tripped value.
	<b>Cause And Effect Matrix (LSCM)</b> Executes interlock and permissive logic to associate as many as 16 inputs (causes) with as many as 16 outputs (effects) to control one or more final elements.
	<b>State Transition Diagram (LSSTD)</b> Implements a state machine. The block changes state based on the values of its transition inputs.
	<b>Step Sequencer (LSSEQ)</b> Drives a number of discrete block outputs based on the input sequence number.

Icon	Function Block Description
	<p><b>Monitor Block (LSMON)</b> Execute interlock and permissive logic to associate as many as 32 inputs with as many as 8 outputs to control other function such as effect blocks <i>NOTE: Only supported on CSLS firmware version 2 or later</i></p>
	<p><b>Effect Block (LSEFFECT)</b> Control one or more final elements based on as many 4 inputs <i>NOTE: Only supported on CSLS firmware version 2 or later</i></p>
	<p><b>Analog Input (LSAI)</b> Reads a single analog signal from an analog input channel and makes it available to other function blocks. The function block performs scaling and provides a square root function for the input data. Analog inputs can be from conventional or HART channels. This function block does not use digital values from HART channels.</p>
	<p><b>Discrete Input (LSDI)</b> Reads a single discrete input from a two-state field device and makes the processed physical input available to other function blocks. You can configure inversion on the input value.</p>
	<p><b>Discrete Output (LSDO)</b> Drives a logic solver discrete output channel to manipulate a solenoid or other final element.</p>
	<p><b>Digital Valve Controller (LSDVC)</b> Connects to Fisher digital valve controllers (DVC 6000 SIS) via a logic solver HART 2-state output channel. Contains all of the parameters found in the Discrete output block plus a set of additional parameters used for partial stroke testing.</p>
	<p><b>Alarm (LSALM)</b> Performs alarm detection on an input. Because the block allows easy access to analog channel data in the Logic Solver, you can choose when alarms are appropriate instead of associating alarming with I/O function blocks.</p>
	<p><b>Limit (LSLIM)</b> Limits an input value between two reference values. The block has options that set the output to a default value or the last value if the input becomes out of range.</p>
	<p><b>Comparator (LSCMP)</b> Compares two values and sets a Boolean output based on that comparison. Comparisons are Less Than, Greater Than, Equal To, Not Equal. The block can also compare the input value against a range to determine if the input is in range.</p>
	<p><b>Middle Signal Select (LSMID)</b> Selects between multiple analog signals. This block selects the mid-valued input from those inputs that are not bad. When there is an even number of inputs in the selection process, the average of the 2 mid-valued inputs is used as the middle value</p>
	<p><b>Boolean Fan Input (LSBFI)</b> Decodes a binary weighted input to individual bits and generates a discrete output value for each bit.</p>
	<p><b>Boolean Fan Output (LSBFO)</b> Decodes a binary weighted input to individual bits and generates a discrete output value for each bit.</p>
	<p><b>Bi-directional Edge Trigger (LSBDE)</b> Generates a True (1) discrete pulse output when the discrete input makes a positive (False-to-True) or a negative (True-to-False) transition since the last execution of the block. If there has been no transition, the discrete output is False (0).</p>

Icon	Function Block Description
	<p><b>Positive Direction Edge Trigger (LSPDE)</b> Generates a True (1) discrete pulse output when the discrete input makes a positive (False-to-True) transition since the last execution of the block. If there has been no transition, the discrete output is False (0).</p>
	<p><b>Negative Direction Edge Trigger (LSNDE)</b> Generates a True (1) discrete pulse output when the discrete input makes a negative (True-to-False) transition since the last execution of the block. If there has been no transition, the discrete output is False (0).</p>
	<p><b>Reset/Set Flip-flop (LSRS)</b> Generates a discrete output value based on NOR logic of reset and set inputs. If the reset input is False (0) and the set input is True (1), the output is True. The output remains True regardless of the set value until the reset value is True. When reset becomes True, the output is False. When both inputs are True, the output is False. When both inputs become False, the output remains at its last state and can be either True or False.</p>
	<p><b>Set/Reset Flip-flop (LSSR)</b> Generates a discrete output value based on NAND logic of set and reset inputs. When there set input is False (0) and the set input is True (1), the output is True. The output remains True until there set input is True and the set input is False. When the reset input is True, the output is equal to the set input. When both inputs are True, the output is True. When both inputs become False, the output remains at its last state and can be either True or False.</p>
	<p><b>Logical And (LSAND), Not And (LSNAND)</b> AND—Generates a discrete output value based on the logical AND of two to sixteen discrete inputs. NAND—Generates a discrete output value based on inverting the logical AND of two to sixteen discrete inputs.</p>
	<p><b>Logical Or (LSOR), Not Or (LSNOR)</b> OR—Generates a discrete output value based on the logical OR of two to sixteen discrete inputs. When one or more of the inputs is True (1), the output is set to True. NOR—Generates a discrete output value based on inverting the logical OR of two to sixteen discrete inputs. When one or more of the inputs is True (1), the output is set to False.</p>
	<p><b>Not (LSNOT)</b> Inverts a discrete input signal. Supports signal status propagation.</p>
	<p><b>Logical Not Exclusive Or (LSXNOR), Exclusive OR (LSOR)</b> XOR—Performs an exclusive OR of two inputs to produce a discrete output. XNOR—Inverts the result of an exclusive OR of two inputs.</p>
	<p><b>Off Delay Timer (LSOFFD)</b> Delays the transfer of a False (0) discrete input value to the output by a specified time period.</p>

	<p><b>On-Delay Timer (LSOND)</b>                  Delays the transfer of a True (1) discrete input value to the output by a specified time period.</p>
	<p><b>Retentive Timer (LSRET)</b>                  Generates a True (1) discrete output after the input has been True for a specified time period. The elapsed time the input has been True and the output value are reset when the reset input is set True.</p>
	<p><b>Timed Pulse (LSTP)</b>                  Generates a True (1) discrete output for a specified time duration when the input makes a positive (False-to-True) transition. The output remains True even when the input returns to its initial discrete value and returns to its original False value only when the output is True longer than the specified time duration. Any 0 to True transition causes the timer to reset.</p>
	<p><b>Calculation/Logic (LSCALC)</b>                  Evaluates a structured text expression.</p>

## Ordering Information

Description	Model Number
ProfessionalPLUS Station	VE2101S xxxxx*
Configuration Software Suite	VE2162
DeltaV SIS Configuration Software License	VS1508
Standalone DeltaV SIS Configuration Software License	VS1509**

\*xxxxx = 00025 to 30000 DSTs -The license limits are enforced on a system-wide basis and not on a per logic solver basis.

\*\* The VS1509, Standalone DeltaV SIS Configuration Software License, provides the same functionality as the VS1508. DeltaV SIS Configuration Software License. Use the VS1509 license when the DeltaV SIS system is connected to a non-DeltaV host DCS, or is otherwise not part of a larger DeltaV system.

## Related Products

- **Configuration Audit Trail.** A powerful tool that tracks changes and manages revision information for any item in the DeltaV SIS configuration database.
- **Operator Display Products.** For increased visibility into your process, the Operator Interface enables high-resolution, real-time displays to easily be created using graphics, text, data and animation tools.
- **Control Studio Online.** Displays online values of safety loops while they are running.

## Related Hardware Products

- **DeltaV SIS Smart Logic Solver 1508.** Smart Logic Solvers (SLS1508) contain the DeltaV SIS logic-solving capability and provide an interface to up to 16 I/O channels that can be configured as Discrete Input, Discrete Output, Analog Input (HART) and HART two-state output channels. See the DeltaV SIS Logic Solver product data sheet for more information.

- **DeltaV SIS CHARMs Smart Logic Solver.** CHARMs Smart Logic Solvers (CSLS) contain the DeltaV SIS logi-solving capabilities and provide an interface to up to 96 individually configurable channels, allowing flexibility for implementing safety instrumented functions and is designed specifically for multi-core home run cables or field junction box installation

## Prerequisites

- DeltaV SIS v8.3 software or later for SLS1508.
- DeltaV SIS v12.3 software or later for CSLS.

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